

SOUTHEAST ROCKFORD
GROUNDWATER CONTAMINATION
SOURCE CONTROL OPERABLE UNIT
QUALITY ASSURANCE
PROJECT PLAN
ADDENDUM

JANUARY 1996

Prepared For:

ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY
BUREAU OF LAND
FEDERAL SITES MANAGEMENT UNIT

Prepared By:

CAMP DRESSER & MCKEE INC.

A P P R O V E D

EPA Region 5 Records Ctr.



227218



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
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REPLY TO THE ATTENTION OF:

MEMORANDUM

DATE: February 8, 1996

SUBJECT: Approval of the First Revision Quality Assurance Project Plan (QAPP) Addendum for the Fund-Lead Remedial Investigation/Feasibility Study (RI/FS) Activities at the Southeast Rockford Groundwater Contamination (SRGC) Source Control Operable Unit (SCOU) in Rockford, Illinois

FROM: Richard L Byvik *Richard L Byvik*
Technical Support Section (TSS)

TO: Turpin Ballard
Remedial Project Manager (RPM)

I am granting approval of the first revision QAPP Addendum for the Fund-Lead RI/FS activities for the SRGC SCOU site, Rockford, Illinois. The subject QAPP was received by TSS on January 26, 1996 (TSS Log-in # 2260). Attached to this memorandum is the signed Signature page.

Attachment

cc: Steve Ostrodka, SRT-4J
Jatinder P. Singh, SR-6J

QUALITY ASSURANCE PROJECT PLAN ADDENDUM
SOURCE CONTROL OPERABLE UNIT
SOUTHEAST ROCKFORD SITE, ROCKFORD, ILLINOIS
NOVEMBER 1995

Approved By: _____ Date: _____
USEPA Region V
Remedial Project Manager

Approved By: Richard L. Byrnie Date: 2/8/96
USEPA Region V
~~Quality Assurance Office~~
Superfund Quality Assurance Reviewer

Approved By: _____ Date: _____
USEPA Region V
Illinois Project Officer

Approved By: _____ Date: _____
Illinois EPA
Project Manager

Approved By: _____ Date: _____
Illinois EPA
Quality Assurance Office

Approved By: _____ Date: _____
Camp Dresser & McKee Inc.
Project Manager

Approved By: _____ Date: _____
Camp Dresser & McKee Inc.
QA/QC Manager

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QUALITY ASSURANCE PROJECT PLAN ADDENDUM
SOURCE CONTROL OPERABLE UNIT
SOUTHEAST ROCKFORD SITE, ROCKFORD, ILLINOIS
NOVEMBER 1995

Approved By: _____ Date: _____
USEPA Region V
Remedial Project Manager

Approved By: _____ Date: _____
USEPA Region V
Quality Assurance Office
Superfund Quality Assurance Reviewer

Approved By: _____ Date: _____
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Project Manager

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Illinois EPA
Quality Assurance Office

Approved By: _____ Date: _____
Camp Dresser & McKee Inc.
Project Manager

Approved By: _____ Date: _____
Camp Dresser & McKee Inc.
QA/QC Manager

1.0 PROJECT DESCRIPTION

The Southeast Rockford Groundwater Contamination Source Control Operable Unit investigation will include a soil gas survey, shallow soil sampling by geoprobe and deep soil borings for the purpose of better defining contaminant source areas, evaluating the presence of non-aqueous phase liquids (NAPLs) in the soils, developing appropriate clean-up levels for soils and evaluating feasible remedial alternatives and/or the need for additional studies.

1.1 STUDY AREA BACKGROUND

The study area background is provided in Section 1.1, page 1-1 of the approved Southeast Rockford Groundwater Contamination Phase II QAPP, March 1993 and the Southeast Rockford Groundwater Contamination Phase II Remedial Investigation Report, June 1994. Additional background is provided in Section 2.0 of the Sampling and Analysis Plan.

1.2 PROJECT SCOPE AND OBJECTIVES

As stated in the Source Control Operable Unit (SCOU), additional investigation will be conducted at Areas 4, 7, 9/10, and 11. These areas either contain or are likely to contain significant concentrations of VOCs that contribute to groundwater contamination in the study area. Principal objectives of the SCOU are to:

- Conduct a soil gas survey, collect soil samples using geoprobe and drill deep soil borings to better define the source areas.
- Evaluate the potential for any dense non-aqueous phase liquids (NAPLs) in the soils through the collection of soil samples in the deep soil borings.

- Determine the nature and **extent** of organic contaminants in surface water and sediments north of area 7.
- Assess whether contamination is **present** in residential and park areas through the collection of surface soil **samples**.
- Gather sufficient site data to **perform** a focused feasibility study at a later date.

In order to achieve these objectives, CDM will work to obtain the following sets of data:

- (1) Soil gas and subsurface soil **data** in vadose zone of source areas;
- (2) Subsurface evaluation of **NAPL** in soil;
- (3) Data on organic contamination **in** sediments and surface water; and
- (4) Data on organic and inorganic contamination in surface soils.

Field work will be conducted as **described** in Section 3.7 and 3.8 of the Work Plan. This work is a continuation of the work **performed** under the Phase II QAPP. The procedures used to perform these tasks are **described in detail** in the Sampling and Analysis Plan (SAP).

1.3 SAMPLING NETWORK DESIGN AND RATIONALE

The scope of sampling for the Source **Control** Operable Unit includes 298 soil gas samples; 150 subsurface soil samples collected **during** geoprobing; 19 subsurface soil samples collected during drilling of deep soil borings; 10 **surface** soil samples and three surface water and four sediment samples. Table 1-1 is a **summary** of the sampling and analysis network and

TABLE 1-1

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT

Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Samples ¹	QC Samples		Matrix Total
				Field Duplicates	Field Blank	
Subsurface soil samples collected during geo-probe work	Qualitative organic vapor screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	150	8	-	158
		CLP RAS B/N/A Extractables ^{2,5}	88	5	-	93
		CLP RAS Pesticides/PCBs ^{2,5}	88	5	-	93
Deep soil borings - Soils collected during drilling	Qualitative organic vapor screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	19	1	-	20
		CLP RAS Metals and Cyanide ^{3,4}	12	1	-	13
Area 7 Creek Sediment	Qualitative screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	4	1	-	5
		CLP RAS B/N/A Extractables ^{2,5}	4	1	-	5
		CLP RAS Pesticides/PCBs ^{2,5}	4	1	-	5
Area 7 Surface Water	pH, conductivity, temperature	CLP RAS Volatile Organics ^{2,5}	3	1	1	5
		CLP RAS B/N/A Extractables ^{2,5}	3	1	1	5
		CLP RAS Pesticides/PCBs ^{2,5}	3	1	1	5
Surface Soil	Qualitative organic vapor screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	10	1	-	11
		CLP RAS B/N/A Extractables ^{2,5}	10	1	-	11
		CLP RAS Pesticides/PCBs ^{2,5}	10	1	-	11
		CLP RAS Metals and Cyanide ^{3,4}	10	1	-	11
Soil Gas Samples	Field GC for 1, 2-DCE, TCA, TCE, PCE, VC, and BETX		298	0	60	358

- Frequency of collection for all investigative and QC samples is 1.
- Contract Laboratory Program Routine Analytical Services (CLP RAS) volatile, extractable and pesticide/PCB compounds are listed in Tables 3-1 through 3-3 of the QAPP.
- Contract Laboratory Program Routine Analytical Services (CLP RAS) inorganic parameters are listed in Table 3-4 of the QAPP.
- No extra sample volume is required for soil matrix spike/matrix spike duplicate (MS/MSD) samples.

- Samples collected for MS/MSD analysis will be collected at double the volume.
- One trip blank will be shipped with each shipment of volatile organics (water samples only).
- MS/MSDs will be collected at a frequency of one per group of 20 or fewer samples.
- Field blanks for soil gas consist of rinseate blanks.

specifies the sample matrix, the parameters to be measured, the number of samples to be collected, and the level of QC effort for each sample type.

All sampling and testing will conform to guidelines set forth in the User's Guide to the EPA Contract Laboratory Program. The QAPP and sections of the SAP discuss the specific sampling and analytical procedures to be followed for this project. Sampling network design and rationale are discussed in the SAP and in subsections 3.7 and 3.8 of the Work Plan.

Based the previous studies at the site (Groundwater Operable Unit and Phase I and II investigations) the primary contaminants of concern for the site are volatile organics. Specifically:

- 1,1,1 - Trichloroethane (TCA)
- Trichloroethene (TCE)
- 1,1,2,2 - Tetrachbroethene (PCE)
- 1,1 - Dichloroethane (1,1-DCA)
- 1,1 - Dichloroethene (1,1-DCE)
- 1,2 - Dichloroethene (1,2-DCE)
- Vinyl Chloride (VC)
- Benzene
- Ethylbenzene
- Toluene
- Zylene

During source area work in Phase II some semi-volatile and pesticide/PCBs were detected in "hot spots". Therefore this investigation will focus on organic contaminants, primarily volatiles. In Areas 4, 7, and 11, there is sufficient existing information on semi-volatile organics, pesticides/PCBs and inorganics in subsurface soils to eliminate them from the

parameters of concern for this phase. **Area 9/10** has little subsurface soil data available so the majority of the full RAS analysis will be conducted in this area.

1.4 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support decisions made during RI/FS activities and are based on the end uses of the data to be collected. As such, different data uses may require different levels of data quality. There are five analytical levels which address various data uses and the QA/QC effort and methods required to achieve the desired level of quality. These levels are:

- Screening (DQO Level 1): This provides the lowest data quality but the most rapid results. It is often used for health and safety monitoring at the site, preliminary comparison to ARARs, initial site characterization to locate areas for subsequent and more accurate analyses, and for engineering screening of alternatives (bench-scale tests). These types of data include those generated on-site through the use of HNu, pH, conductivity, and other real-time monitoring equipment at the site.
- Field Analyses (DQO Level 2): This provides rapid results and better quality than in Level 1. This level includes mobile lab-generated data depending on the level of quality control exercised. Level 2 data will be generated by onsite GC analysis of soil gas.
- Engineering (DQO Level 3): This provides an intermediate level of data quality and is used for site characterization. Engineering analyses may include mobile lab-generated data and some analytical lab methods (e.g., laboratory data with quick turnaround used for screening but without full quality control documentation). Level

3 data will not be generated during the SCOU.

- Confirmational (DQO Level 4): This provides the highest level of data quality and is used for purposes of risk assessment, evaluation of remedial alternatives, and PRP determination. These analyses **require** full Contract Laboratory Program (CLP) analytical and data validation **procedures** in accordance with EPA recognized protocol. Level 4 data will be **generated** from the collection of soil, sediment and surface water samples analyzed for TCL organics and TAL inorganics (see Table 1-2).
- Non-Standard (DQO Level 5): This refers to analyses by non-standard protocols, for example, when exacting **detection limits** or analysis of an unusual chemical compound is required. These analyses **often require** method development or adaptation. The level of quality control is usually **similar** to DQO Level 4 data. Level 5 data will not be generated during the SCOU.

1.5 SCHEDULE

The anticipated schedule for key activities in this SCOU is provided in the Work Plan Section 5.0.

TABLE 1-2
SOUTHEAST ROCKFORD SCOU
PRELIMINARY DATA QUALITY OBJECTIVES SUMMARY

DATA GATHERING ACTIVITY	SOIL GAS SURVEY	GEO-PROBE AND SOIL BORING INSTALLATION	SURFACE WATER SAMPLING	SEDIMENT SAMPLING	SURFACE SOIL SAMPLING
Objectives and Data uses	Identify contaminated areas during source investigation Evaluate need for additional study/immediate remedial action Provide source information for evaluation of contaminant fate and transport Provide information to design treatability studies	Confirm and further define nature of contamination in "hot spots" identified in soil gas survey Evaluate need for additional study/immediate remedial action Provide information to evaluate presence of NAPL in subsurface soils Provide data to determine preliminary remediation goals	Evaluate impacts from area 7 on surface water Evaluate need for additional study/remedial action Provide data to evaluate health and environmental risks	Evaluate impacts from area 7 on sediment Evaluate need for additional study/remedial action Provide data to evaluate health and environmental risks	Access if contamination is present in residential and park areas Evaluate need for additional study/remedial action Provide data to evaluate health and environmental risks
Appropriate Analytical Levels	Screening level site evaluation: Level 2	Site characterization: Level 4	Site characterization: Level 4	Site characterization: Level 4	Site characterization: Level 4
Data Needs	Target VOCs 1,2 DCE, DCA, TCE, TCA, PCE and BETX in potential source areas to target the soil boring program and design treatability studies	CLP TCL organics and CLP TAL inorganics to evaluate areas of likely high VOC concentrations	CLP TCL organics to evaluate impacts from area 7	CLP TCL organics to evaluate impacts from area 7	CLP TCL organics and inorganics to characterize contamination

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Camp Dresser and McKee Inc. (CDM), as prime contractor, has overall responsibility for all phases of the Southeast Rockford Source Control Operable Unit (SCOU) and will oversee the field investigations and prepare the Technical Memorandum. CDM will also provide QA/QC for all deliverables and provide for their issuance.

2.1 PROJECT ORGANIZATION

The project organization structure (see Figure 2-1) shows the staff designations, assignments and lines of communication for the SCOU.

2.2 IEPA PERSONNEL

2.2.1 PROJECT MANAGER

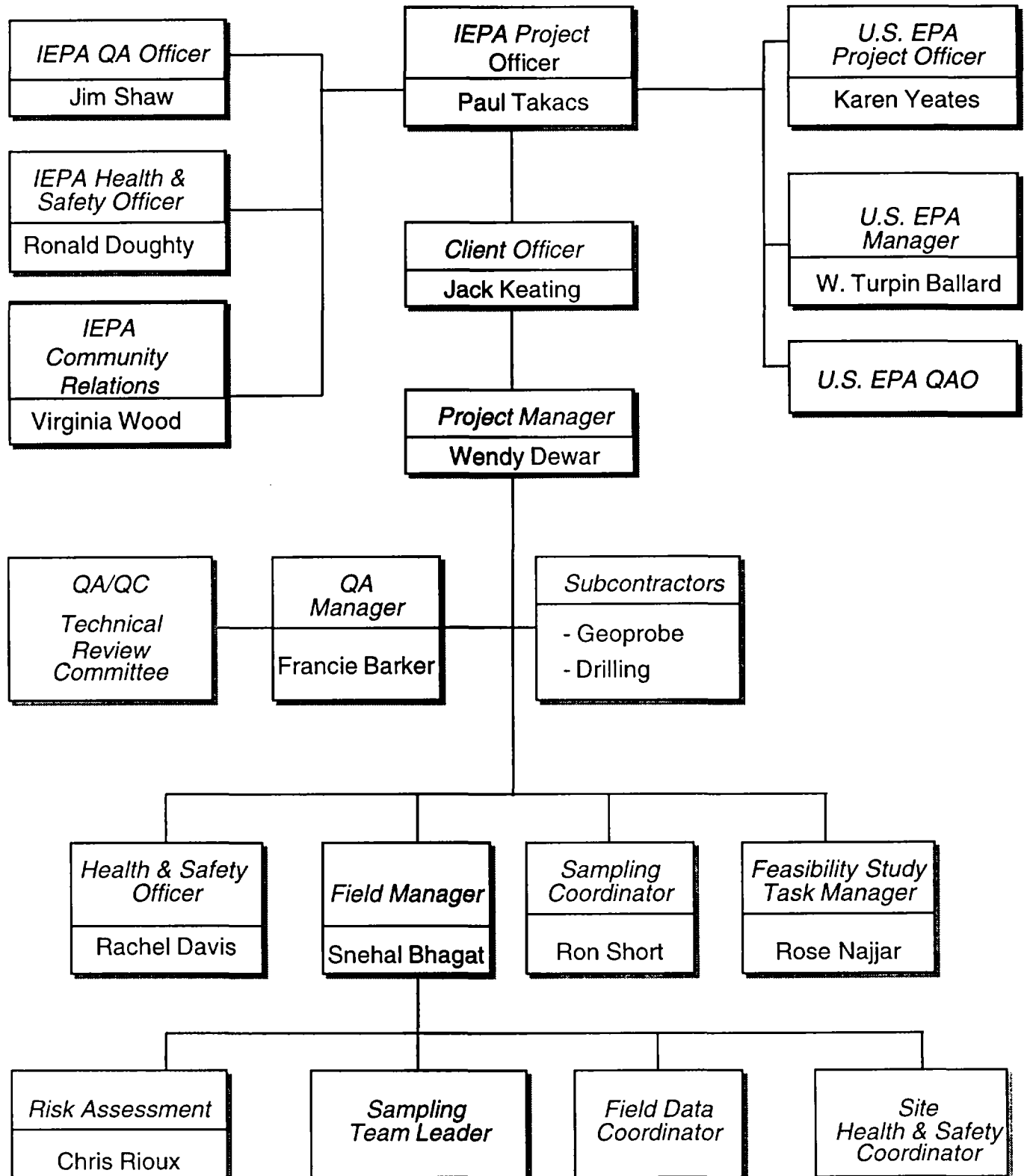
Project Manager, Mr. Paul Takacs, is responsible for overall management and coordination of technical and fiscal aspects of the SCOU. Mr. Takacs will be the IEPA contact with the USEPA Region V Project Manager.

2.2.2 QUALITY ASSURANCE OFFICER

The Quality Assurance Section Project Officer, Mr. Jim Shaw, is responsible for the QAPP technical review. Mr. Shaw is available for consultation on various QA/QC issues.

Southeast Rockford Source Control Operable Unit Organization Chart

Figure 2-1



2.2.3 HEALTH AND SAFETY OFFICER

The Health and Safety Officer, Mr. Ronald Doughty, is responsible for the review of the Health and Safety Plan.

2.3 USEPA PERSONNEL

2.3.1 STATE PROJECT OFFICER

The USEPA State Project Officer, Mr. John Oakes, is responsible for federal oversight of state-lead activities for the state of Illinois.

2.3.2 REMEDIAL PROJECT MANAGER

The USEPA Region V Remedial Project Manager, Mr. Turpin Ballard, is responsible for oversight of the SCOU.

2.3.3 LABORATORY TESTING ASSIGNMENTS

- Terra-Trace will analyse the soil gas samples onsite with a field GC using the procedures described in Appendix A.
- USEPA Contract Laboratory Program (CLP) will analyze all liquid and soil samples except for screening-level samples as part of the Routine Analytical Services.

2.3.4 LABORATORY QA/QC RESPONSIBILITIES

- Soil Gas Samples
 - Requests initiated by CDM sampling team
 - QA/QC procedures described in Appendix A
 - Final data review by CDM Project Organization

- CLP Routine Analytical Services (RAS)
 - Request initiated by CDM sampling team
 - Support Services Branch, Office of Emergency and Remedial Response, USEPA Headquarters
 - USEPA EMSL, Las Vegas
 - Final data review by CDM Project Organization
 - Review of tentatively identified compounds and assessment of need for confirmation by CDM Project Organization

2.3.5 REGIONAL SAMPLE CONTROL COORDINATOR

The USEPA Region V Regional Sample Control Coordinator (RSCC) will be the contact point for the scheduling of CLP RAS analyses. The RSCC will be responsible for training the CDM Field Team Leader in the use of the USEPA CLP and its associated paperwork.

2.4 CONTRACTOR PERSONNEL

CDM, as contractor to IEPA, will **analyze the data** generated by the SCOU field activities. CDM will be responsible for **completion of tasks** specified in the Statement of Work which includes field measurements, **sample collection**, and the preparation of the Technical Memorandum.

2.4.1 PROJECT MANAGER

The Project Manager is responsible for **day-to-day** management and coordination of the contractor staff. This duty includes, **but is not limited to**, ensuring that all contractor and subcontractor staff understand and **comply with the QA/QC program**. The Project Manager is responsible for the Work Plan and **review of data** generated from field measurements and activities. The Project Manager will also **be responsible** for preparing the Technical Memorandum.

2.4.2 PROJECT QUALITY ASSURANCE MANAGER

The CDM Quality Assurance Manager is **responsible** for providing specific QA support to the Project Manager and coordinating **QA technical** operations among task teams performing duties that are assigned to CDM during **this SCOU**.

representativeness and comparability, see Section 15, Glossary of Terms). This SCOU investigation has been designed to provide sufficient data to achieve the project objectives (subsection 1.2).

The sampling network was designed to provide data representative of site conditions. To achieve the goal of obtaining representative site data the standard operating procedures described in this QAPP addendum and SAP will be adhered to during the project. During development of this sampling network, consideration was given to past waste disposal practices, existing analytical data, physical setting and processes. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data, as documented in this QAPP addendum, are expected to provide data that will be comparable to the data collected in the Phase I and Phase II studies of this investigation. This will be achieved by using CLP RAS/ analytical protocols, QA/QC, and reporting.

3.4 FIELD MEASUREMENTS

Measurement data will be generated in many field activities that are incidental to collecting samples for analytical testing or unrelated to sampling. These activities include, but are not limited to, the following:

- Documenting time and weather conditions;
- Locating and determining the elevation of sampling stations;
- Determining pH and temperature of water supply;

- Determining depths in a borehole; and
- Indoor and ambient air sampling.

The general QC objective for such measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the intended use of the data through the documented use of standardized procedures. The procedures for performing these activities and the standardized formats for documenting them are presented in the SAP.

Completeness, representativeness and comparability (defined in Section 15.0) are discussed below and are addressed in the analytical field procedures (Appendix B). The completeness for analytical field results for this phase will be 90% or better. Representative field data will be obtained by performing all field sampling and field measurements in a standardized manner by strictly adhering to the procedures specified in this QAPP addendum and in the SAP and Work Plan. Qualitative comparability will be achieved by following QA/QC sampling and analytical procedures outlined in the QAPP addendum, SAP and Work Plan.

The precision and accuracy of pH measurements will be assessed in the field prior to analysis. The calibration of the pH meter will be conducted at the beginning of the day prior to use. The calibration of the pH meter (Appendix B) will be performed by taking two measurements on each of two standard buffer solutions of pH 4 and pH 7. The accuracy will be determined by the difference in replicate samples of the standard pH buffer solutions. These measurements should be within ± 0.1 pH units from the value of the standard solutions. Replicate analysis will be completed on both standards and the difference between the replicates will be within ± 0.1 standard pH units of the known value of the standard buffer solution. The precision will be less than or equal to 0.1 difference between the two

measurements on each pH standard **buffer** solution. If the pH meter fails to calibrate properly, a different pH meter will be **calibrated** and used.

The calibration measurements made **for the specific** conductance will be used to assess the accuracy and precision of the **instrument used**. The calibration of the instrument will be made by making two measurements **on a standard**. The standard used will be a solution of 0.01 demol KCl. The accuracy will be **within 10%** of the standard value and precision will be less than or equal to 15% of the **difference between** the two replicate measurements of the standard. If the measurements are **not within $\pm 10\%$** of the standard or are not reproducible within **$\pm 15\%$** , the instruments will be **returned** to the manufacturer for maintenance and calibration.

The calibration procedures for the HNu are outlined in Appendix B. The HNu will be calibrated after each field use or prior to each field use if the instrument has not been calibrated during the previous 14 **calendar days**. Isobutylene will be used as the standard. The instrument will be calibrated in the **0-20 ppm** range and the **20-200 ppm** range. If the instrument measurements are not **within $\pm 15\%$** of the known standard in either of the two calibration ranges, the instrument will be **sent back** to the manufacturer for maintenance and calibration.

The calibration procedures for the Organic Vapor Analyzer (OVA) are outlined in Appendix B. This instrument will be calibrated **after each** field use or prior to each field use if the instrument has not been calibrated **during the** previous 14 calendar days. The manufacturer calibrates the OVA with methane **at the factory**. The minimum detection limit for methane is 0.2 ppm. For precise analysis, it is **necessary** to recalibrate with the specific compound of interest. A commercially available **standard** will be used if it is necessary to recalibrate for a specific compound. If the instrument is **not within $\pm 15\%$** of the standard, the instrument

will be sent back to the manufacturer to be recalibrated.

The level of QC for the thermometer will consist of a calibration check using an ice/water slurry once at the beginning of field activities. The thermometer must read $\pm 0.5^{\circ}$ C. If the thermometer is out of calibration, it will be replaced.

TS5
for the case. The Contract Analytical Services Section (~~CASS~~) will be responsible for the final evidence audit of these files and their secure storage.

The contractor will maintain the site files along with all relevant records, reports, logs, field notebooks, pictures, subcontractor reports and the data and data reviews of the CLP and screening level generated laboratory data in a limited access area and under custody of the contractor's Site Manager.

The final evidence file will include, but not be limited to:

Project Plans	Graphs
Field Data Records	Calculations
Logbooks	Raw Data Summaries
Sample Tags	Data/Purge Files
Chain-of-Custody Records	Correspondence
Sample Tracking Records	Data Validation Files and Reports
Analytical Logbook Pages	Report Notes
Bench Sheets	Miscellaneous-Photos, Maps, Drawings, etc.
Instrument Readout Records	Final Report
Computer Printouts	

7.0 ANALYTICAL PROCEDURES

For the Southeast Rockford SCOU, the analytical procedures for the CLP Laboratory are specified in the current USEPA CLP SOW OLM03.1 for RAS low-medium concentration organic analyses, in the current CLP SOW ILM03.0 for RAS low-medium concentration inorganic analyses or most current versions. The analytical method to be used for field screening for soil gas is provided in Appendix A.

Analytical procedures for field analytical equipment are discussed in the Sampling and Analysis Plan.

Standard analytical procedures for field and laboratory analytical equipment are discussed in Section 12.

9.0 DATA REDUCTION, VALIDATION AND REPORTING

Data reduction, evaluation and reporting of those samples analyzed by CLP laboratories will be performed in accordance with the specifications of the USEPA Contract Laboratory Program. The data management approach for CLP-analyzed samples is illustrated with the logic diagram shown in Figure 9-1. Data reduction for RAS analytical services performed by USEPA CLP will be in accordance with current CLP Statements of Work (SOW) for organics and inorganics. Data reporting for RAS analytical services will be in accordance with current CLP Statements of Work (SOW).

Data reduction for RAS analytical services at the USEPA CLP will be in accordance with the current CLP Laboratory Statement of Work (SOW). The data will be assessed by verification of the reduction results and confirmation of compliance with QA/QC requirements.

The analytical data from the field screening of soil gas for volatile organics analysis will be evaluated for accuracy precision and completeness in the field. The data will be assessed by reviewing field and laboratory duplicates and blanks and the results will be summarized in the report.

Raw data from field measurements and sample collection activities will be appropriately recorded in the field log book. If the data is to be used in the project reports, it will be reduced or summarized and the method of reduction documented in the report.

The CLP RAS analytical data will be validated by USEPA ^{TSS}~~CASS~~ personnel to ensure that the data is sufficient to support the risk assessment and the feasibility study. The data validation procedures are provided in two USEPA documents. These documents are: USEPA Contract

Laboratory Program National Functional Guidelines for Organic Data Review, 2/94; and
USEPA CLP National Functional Guidelines for Evaluating Inorganic Analyses Data Review,
2/94.

Southeast Rockford SCOU
QAPP Addendum
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Revision No. 1
Date January 22, 1996
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APPENDIX A
STANDARD OPERATING PROCEDURES FOR SOIL GAS SAMPLE COLLECTION AND
ANALYSIS

**LANDMARK TECHNOLOGIES, INC.
METHOD L8021SG**

**PERPARED FOR CDM
4 AUGUST 1995
Revised
24 OCTOBER 1995**

**SOUTHEAST ROCKFORD
GROUNDWATER CONTAMINATION SITE**

**STANDARD OPERATING PROCEDURES
FOR FIELD ANALYSES OF SOIL GAS**

GC101
GC102c
GC103c
GC105
GC109c
GC110
GC117
GC118

FIELD PROCEDURE NO. GC101

SRI MODEL 8610 GAS CHROMATOGRAPH START-UP
with SRI MODEL 8690-0051 PURGE-and-TRAP

PROCEDURE:

1. Check column configuration.
 - 1.1. Target compounds are: 1,2-DCE (trans and cis), 1,1,1-TCA, PCE, TCE, 1,1-DCA, and Vinyl Chloride.

Then install: 75m, 0.53mm ID, 3.0um Rtx-624 Column.
Tenax GR Trap.

Set column flows to: 10 cc/min. Hydrogen

Set column temperature to: 40 C to 165 C at 6 C/minute.
2. Turn on the Hydrogen and Helium tank valves and adjust the regulator line pressures to 60 psi and 40 psi, respectively.
3. Turn on computer.
 - 3.1 Load PeakSimple® Software.
 - 3.1.1 Turn on GC.
 - 3.1.2 Go to the Controls Menu and load appropriate control file.
 - 3.1.3 Turn on Purge-and-Trap.
4. Allow injector, oven, detectors, and purge-and-trap to achieve thermal equilibrium.
5. Check all pressure settings.

5.1 Column carrier gas.

NOTE: Flows must be set when new columns are installed or when the line pressure has been changed.

5.1.1. Switch LCD toggle to the down position and confirm carrier pressure setting.

5.1.2. Adjust the flow using the appropriate flow controller on the left front panel of the GC (100 equals 6.7 cc/min Hydrogen at regulator pressure setting of 50 psi).

5.2 Sparge gas.

NOTE: Flows must be reset when line pressure is changed.

5.2.1. Switch LCD toggle to the down position and confirm sparge gas pressure setting at 8.3 psi.

5.2.2. Adjust the flow using the appropriate flow controller on the left side panel of the GC.

5.3 ELCD propanol delivery gas (Helium is utilized to pressurize the propanol delivery vessel.

NOTE: Flows must be reset when line pressure is changed.

5.3.1. Observe pressure regulator dial in propanol delivery tray. Regulator should be set at 5 - 8 psi.

5.3.2. Adjust the flow using the appropriate flow controller on the front panel of the propanol delivery tray.

6. Check for leaks by placing a few drops of Leak Check® above the nuts on all column fittings in the oven.
7. Check detector attenuation and gain settings on right side of GC:

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7.1 PID - 1/LOW

7.2 ELCD - 1/LOW

8. Note the following chromatographic parameters in the GC daily log book:
 - a) Analyst name
 - b) Date
 - c) Trap, valve, injector, column, and detector temperatures
 - d) Sparge and column flows
 - e) ELCD and PID attenuation and gain
 - f) Column type, diameter, and length
 - g) Trap type
9. Allow baselines to stabilize **before** calibration (about 15 minutes).

FIELD PROCEDURE NO. GC102c

PREPARATION OF GASEOUS CALIBRATION STANDARDS FOR
5-POINT CALIBRATION

SUMMARY OF METHOD:

A 10 ppm gas mixture containing the chemical standards in a balance of pure (98%) VOC-free nitrogen is purchased from Scott Specialty Gases a commercial vender.

Five working standards are prepared at the beginning of each work week by serial dilution. The working standards are prepared in 500 mL Tedlar bags by diluting the appropriate quantity of the stock gas mixture into 500 mL of pure (98%) VOC-free nitrogen.

Each compound will be quantified at five concentration levels (1 ug/L, 5 ug/L, 50 ug/L, 500 ug/L, and 1,000 ug/L). The calibration is considered linear if their associated coefficient of linear regression is .95 or higher. If the calibration is considered linear then an average response factor will be used to quantify sample concentrations.

SUPPLIES:

- Dedicated 1,000 uL and 10 mL gas tight syringes
- Pure (98%) VOC-free nitrogen
- 500 mL Tedlar bags
- Stock gas mixture

PROCEDURE:

1. Analyze the VOC-free nitrogen used to make the working standards once per job (or once per week if job lasts more than one week) to check its purity and check for injector insert contamination.

NOTE: This must be documented with a chromatograph.

2. Retrieve the dedicated gas tight syringes to transfer stock gas mixture to the working standard Tedlar bags.
3. Obtain five 500 mL Tedlar bags with Teflon-lined septum and fill with VOC-free nitrogen. Label the bags with standard ID, concentrations, date, and your initials.

5. Flush the dedicated gas tight syringe with VOC-free nitrogen once by withdrawing approximately 80% of syringe capacity and expelling it outside the feed line.

NOTE: Do not expel the rinse into the nitrogen feed line as it may contaminate the delivery system.

6. Inject the appropriate amount of primary methanol standard into water to yield five concentrations: 1) equal to the detection limit; 2) 5 times the detection limit; 3) 10 times Number 2; 4) 10 times Number 3; and 5) the maximum value for that compounds linear range.

Analyte/Calibration Levels*	1	2	3	4	5
Vinyl chloride	1	5	50	500	1000
1,2-Dichloroethene	1	5	50	500	1000
1,1-Dichloroethane	1	5	50	500	1000
Trichlorethene	1	5	50	500	1000
1,1,1-Trichloroethane	1	5	50	500	1000
Tetrachloroethene	1	5	50	500	1000

* Calibration levels are ug/L

NOTE: When injecting the gas mixture into the nitrogen filled Tedlar bag, depress the plunger and remove the needle. Do not flush the needle with the newly created standard.

FIELD PROCEDURE NO. GC103c

5-POINT CALIBRATION FOR GASEOUS STANDARD ANALYSIS
UTILIZING A PRE-COLUMN CONCENTRATOR

EQUIPMENT:

- Gas Chromatograph
- Detector
- Computer
- Purge-and-trap concentrator

SUPPLIES:

- 100 mL gas tight syringes
- 500 mL Tedlar bags with septums

PROCEDURE:

1. Follow Procedure GC101 for GC start-up. Instrumentation is now ready for calibration.
2. Prepare standards via Procedure GC102c for target compounds.
3. Analyze one of each of the following to determine if any contamination exists in the analytical equipment or supplies.
 - 3.1. Carrier Gas Blank: Blank a 100 mL syringe with carrier gas at the start of each day.

NOTE: If any of the **representative** syringes show contamination, all syringes must be blanked prior to use.

If it is necessary for any syringe to be used again before cleaning, it must be blanked prior to its second use.

- 3.1.1. Obtain a clean 100 mL glass syringe.
- 3.1.2. Purge syringe and needle of dead volume by extracting and expelling carrier gas several times.
- 3.1.3. Fill purged syringe with 100 mL of carrier.

- 3.1.4 Press space bar on the computer key board to initiate the run.
- 3.1.5 Introduce sample through the injection port on the purge-and-trap.
- 3.1.5. Analysis starts now.
- 3.1.6. Update chromatograph data file with blank ID, and injection volume.
- 3.1.7 Quality control for this sample requires that the compounds of interest not be present at or above the method detection limit.
- 3.2 Nitrogen Blank: The VOC-free nitrogen is checked at the beginning of each day, or once per week if the job lasts longer than a week, to determine if any contamination exists in the nitrogen or injection port insert.
 - 3.2.1 Obtain a clean 100 mL syringe.
 - 3.2.2 Purge the syringe by drawing VOC-free nitrogen into the syringe and expelling it several times.
 - 3.2.3 Draw 100 mL of VOC-free nitrogen into the syringe as measured from the end of the plunger.
 - 3.2.4 Press space bar on the computer key board to initiate the run.
 - 3.2.5 Introduce sample through the injection port on the purge-and-trap.
 - 3.2.6 Analysis starts now.
 - 3.2.7 Update chromatograph data file with blank ID, and injection volume.
 - 3.2.8 Quality control for this sample requires that the compounds of interest not be present at or above the method detection limit.
- 4. Analyze each of the five different standard concentration levels at the start of each job (or once per week if the project lasts more than one week). Then enter the results from each concentration level into the project specific calibration table (see Procedure GC105) allowing the computer to calculate the response factors for each concentration level. The five response factors are considered to be linear if their associated coefficient of linear regression is .95 or higher. In this case, the average of the response factors can be used to quantify sample concentrations.

A continuing calibration verification standard or quality control [QC] check standard will be performed at the start of each project day, after every 10 field samples, and at the end of each project day. The QC criteria for these standards requires that the calculated concentrations for these standards falls within +/- 20% of the known concentration injected.

- 4.1. Retrieve the 100 mL dedicated syringe for the compound suite of interest. If a dedicated syringe is not available, blank a 100 mL syringe and dedicate it to the standard.
- 4.2. Insert needle into gaseous standard Tedlar bag and extract 100 mL.
- 4.3. Press space bar on the computer key board to initiate the run.
- 4.4. Introduce sample through the injection port on the purge-and-trap.
5. Analysis begins now.
6. Update chromatograph data file with standard ID, and injection volume.
7. After each of the five gaseous concentrations have been run analyzed, integration checked, and linear regression confirmed (>.95) the GC is now programed with the 5-point calibration curve for gaseous standard analysis.
8. Before running samples, one of each of the following should under go analysis to determine if any contamination exists in the sampling equipment or supplies.
 - 8.1. System Blank: System blanks are ambient air drawn through an aboveground sampling probe and complete sampling apparatus (probe, adaptor, and syringe). Analyze system blank by the same procedure as a soil gas sample (Procedure GC109).
 - 8.1.1. One system blank is run at the start of each day and compared to a concurrently sampled ambient air analysis.
 - 8.1.2. Run a system blank before reusing any sampling system component.
 - 8.2. Ambient Air Sample: Collect a sample of ambient air near the system blank probe at the same time the system blank is taken. Analyze air samples by the same procedure as a soil gas sample (Procedure GC109).

Run at least two additional ambient air samples during the day to monitor site background concentrations.

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9. Input into the computer and GC log book the following information for the carrier blank, nitrogen blank, system blank, and ambient air sample:
 - a) sample identification
 - b) time of analysis
 - c) injection volume
 - d) sample volume
 - e) area counts of target compounds
10. GC is ready for direct injection analysis of soil gas samples.

FIELD PROCEDURE GC109

DIRECT INJECTION ANALYSES OF SOIL GAS SAMPLES UTILIZING A PER COLUMN CONCENTRATOR

SUMMARY OF METHOD:

Chromatographic retention time identifies halocarbon and hydrocarbon compounds detected in soil gas. Verification of compound identity can be enhanced by chromatographic analysis via in-series utilization of detectors with differing selectivity.

Quantification of compounds is achieved by comparison of the detector response of the sample with the response measured for calibration standards (external standardization). System blanks are run at the beginning of the day to check for contamination in the soil gas equipment. Instrument calibration checks are run periodically through out the day. Ambient air samples are also routinely analyzed to check for background levels in the atmosphere. At least three air samples should be collected each day.

Proprietary modifications to the gas chromatograph allow direct injections of soil gas samples/standards for analysis.

EQUIPMENT:

- Gas Chromatograph
- Detector
- Computer
- Purge-and-trap

SUPPLIES:

- 100 mL, 10 mL, and 1 mL Glass Syringes
- 500 mL Tedlar bags
- Pure (98%) VOC-free nitrogen
- Calibration Standard

PROCEDURE:

1. Follow Procedure GC101 for GC start-up.
2. Follow Procedure GC102c for preparation of gaseous calibration standards for 5-point calibration.

3. Follow Procedure GC103c for calibration for gaseous standard analysis utilizing a pre-column concentrator.
4. Instrumentation is now ready for sample analyses. Run samples as they are collected.
 - 4.1. Inject 100 mL of sample whenever possible so long as peak response does not exceed the linear range of the detector.
 - 4.2. Whenever possible, keep the attenuation for unknown samples constant throughout the day to facilitate verification of integration.
 - 4.3. Document all changes.
 - 4.4. If linear range is exceeded for any compound, reduce the injection size until the response becomes linear.
 - 4.5. If response remains outside of linear range with a 10 uL injection, dilute the sample via Procedure GC110.
- NOTE: Dilutions should be avoided if possible. Small injections with microliter syringes produce more reliably accurate results.
- 4.6. Document all sample analysis.
- 4.7. Label all analyses in ug/L. Avoid PPM and PPB notations.
5. Obtain a clean 100 mL glass syringe. This is the sub-sampling syringe.
6. Insert the needle of the 100 mL syringe through the septa of the 500 mL Tedlar sample bag.
7. Purge the syringe and needle several times with sample to lessen the effect of needle dead space dilution.
8. Extract 100 mL sample from the Tedlar sample bag.

NOTE: This is called a sub-sample.

Actual sample volume will be determined by the response of the target compounds. The sample volumes may range from 10 uL for high response to 100 mL for low response. Often, the client is aware of potential sources and can warn you when high concentrations are expected.

9. Press space bar on the computer key board to initiate the run.
10. Introduce sample through the injection port on the purge-and-trap.
11. Analysis begins now.
12. Update chromatograph data file with the sample ID and sample volume. After duplicate analyses have been run (if necessary), integration checked, and surrogate reproducibility confirmed (within 20%), input into the GC log book the following information for each injection and save results to the computers hard drive:
 - a) sample identification
 - b) time of analysis
 - c) volume of injection
 - d) area counts of target compounds
13. After all samples have been analyzed copy all computer files (i.e., .chr, .tem, .con, .res, etc.) to 3.5" diskettes.
14. Place used syringes in a separate container for decontamination.

**SOUTHEAST ROCKFORD
GROUNDWATER CONTAMINATION
SOURCE CONTROL OPERABLE UNIT
SAMPLING AND ANALYSIS PLAN
ADDENDUM**

JANUARY 1996

Prepared For:

**ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY
BUREAU OF LAND
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SAMPLING AND ANALYSIS PLAN

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1.0 INTRODUCTION

1.1 OBJECTIVES OF SAMPLING PROGRAM

This Sampling and Analysis Plan (SAP) **describes** the field activities required for the Southeast Rockford Groundwater Contamination Source Control Operable Unit (SCOU) study. The objectives of the sampling **program** are as follows:

- Evaluate potential source **areas** (Areas 4, 7, 9, 10 and 11) defined in Phases I and II;
- Collect data to support source **remediation**; and
- Establish soil cleanup levels.

1.2 SAMPLING TEAM RESPONSIBILITIES

Field sampling will be performed by **Camp Dresser & McKee (CDM)**. The project organization chart is shown in the **Southeast Rockford SCOU Quality Assurance Project Plan (QAPP) Addendum**. Responsibilities of the **sampling** team are described below.

Field Manager

The Field Manager (FM) will be **responsible for** assigning the sampling team responsibilities (in conjunction with the Site Manager), **as well as** overseeing all field activities. The FM will coordinate mobilization and demobilization **for the** CDM sampling team, as well as for any subcontractors. The FM will be **responsible for keeping** the Site Manager up to date on all

sampling and subcontractor activities.

Sampling Team Leader

The Sampling Team Leader (STL) will be **responsible** for the sampling efforts, will assure the availability and maintenance of all **sampling equipment** and materials, and will maintain an adequate supply of shipping and packing **materials**. The STL will supervise the completion of all chain-of-custody records, the **proper handling** and shipping of the samples collected, be responsible for the accurate completion of **field log books**, and provide close coordination with the Field Data Coordinator (FDC) and the Field Manager (FM). The STL or FM will be present whenever samples are collected.

Sampling Team Member(s)

The Sampling Team Member(s) (STM) will **perform** field measurements, collect samples, prepare samples for shipping, and **decontaminate** sampling equipment as directed by the STL.

Field Data Coordinator

The Field Data Coordinator (FDC) will **remain in** the support area and will accept custody of samples from the sampling team. The FDC will be responsible for the completion of all chain-of-custody and sample traffic control **forms**. The FDC will also be responsible for maintaining communications with **on-site personnel** and off-site laboratory personnel, as well as for logging all communications and **site entries** and departures.

Site Health and Safety Coordinator (SHSC)

The SHSC is responsible for daily supervision and documentation of all safety, decontamination, environmental monitoring and field medical monitoring activities. The SHSC is responsible for assuring that all field personnel comply with the provisions of the CDM Health and Safety Assurance Manual and site Health and Safety Plan. The SHSC has the authority to suspend site work if conditions become unsafe, if HSAM/HSP requirements are not met, or if he/she determines that an upgraded level of protection may be required. The SHSC is responsible for designating and marking restricted areas during various site activities and for redesignating these areas when it is appropriate to do so.

Safety Technician

The Safety Technician (a designated member of the sampling team) will assist with sampling, aid other sampling team members with the donning and doffing of protective clothing, decontamination of sample containers and equipment, and will be available to replenish miscellaneous supplies, such as ice and vermiculite, as needed. The Safety Technician will report directly to the SHSC in health and safety related duties and will assume the responsibilities of the SHSC in the event of his/her absence from the site or in an emergency.

1.3 SCOPE OF SAMPLING ACTIVITIES

The scope of sampling activities detailed by this plan include various phases of collection and analysis that will be performed during this investigation. 150 soil samples will be collected for chemical analysis during the advancing of an estimated 298 soil gas probes; additional soil samples will be collected for lithological and chemical analysis during the advancement of thirteen deep soil borings. A maximum of ten surface soil samples will be collected at locations determined in the field based on the results of the soil gas sampling. In

four sediment and three surface water **samples** will be collected from the creek which runs along the northern boundary of Area 7.

Table 1-1 is a summary of the **sampling and analysis** program. The numbers of borings and samples installed or collected during **the SCOU** will depend on the results of certain ongoing field activities (including soil gas and **Geoprobe** work); as a result, the actual numbers of borings and samples installed or collected **will likely vary somewhat** from those given in this SAP, or in the Work Plan and QAPP.

TABLE 1-1

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT

Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Samples ¹	QC Samples		Matrix Total
				Field Duplicates	Field Blank	
Subsurface soil samples collected during geo-probe work	Qualitative organic vapor screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	150	8	-	158
		CLP RAS B/N/A Extractables ^{2,5}	88	5	-	93
		CLP RAS Pesticides/PCBs ^{2,5}	88	5	-	93
Deep soil borings - Soils collected during drilling	Qualitative organic vapor screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	19	1	-	20
		CLP RAS Metals and Cyanide ^{3,4}	12	1	-	13
Area 7 Creek Sediment	Qualitative screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	4	1	-	5
		CLP RAS B/N/A Extractables ^{2,5}	4	1	-	5
		CLP RAS Pesticides/PCBs ^{2,5}	4	1	-	5
Area 7 Surface Water	pH, conductivity, temperature	CLP RAS Volatile Organics ^{2,5}	3	1	1	5
		CLP RAS B/N/A Extractables ^{2,5}	3	1	1	5
		CLP RAS Pesticides/PCBs ^{2,5}	3	1	1	5
Surface Soil	Qualitative organic vapor screening with PID or OVA	CLP RAS Volatile Organics ^{2,5}	10	1	-	11
		CLP RAS B/N/A Extractables ^{2,5}	10	1	-	11
		CLP RAS Pesticides/PCBs ^{2,5}	10	1	-	11
		CLP RAS Metals and Cyanide ^{3,4}	10	1	-	11
Soil Gas Samples	Field GC for 1, 2-DCE, TCA, TCE, PCE, VC, and BETX		298	0	60	358

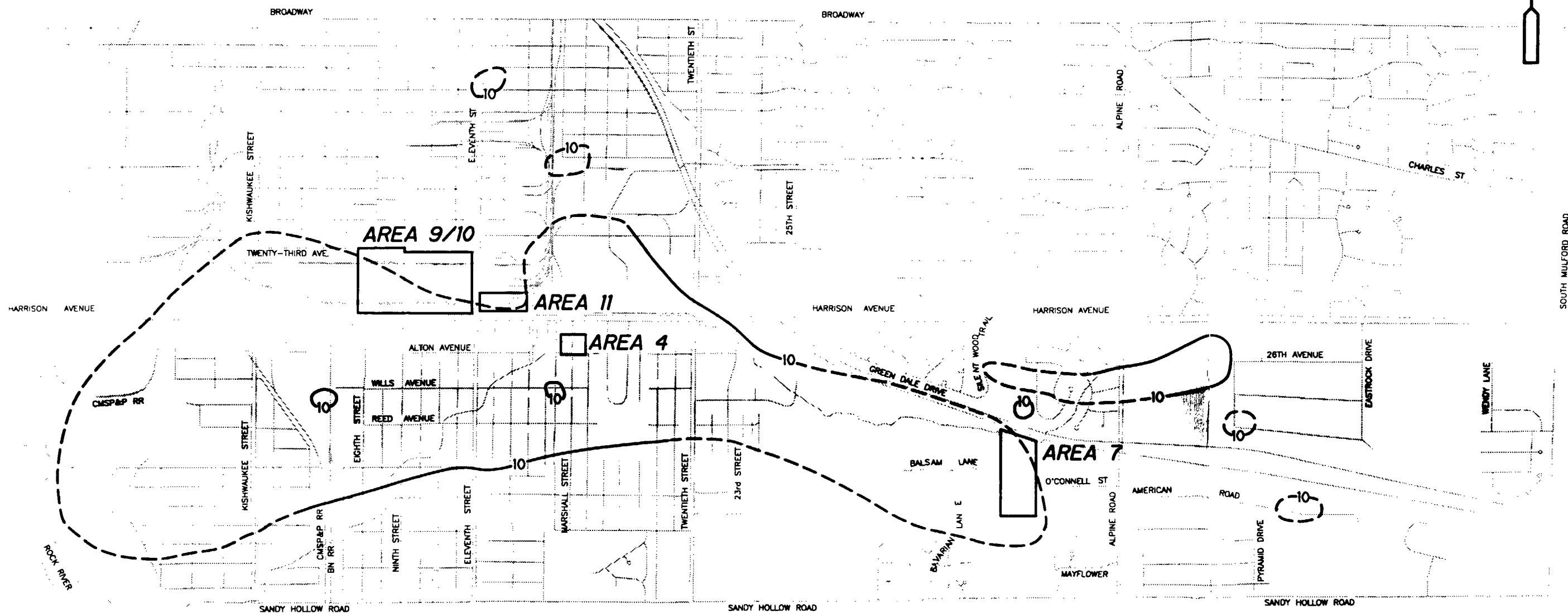
1. Frequency of collection for all investigative and QC samples is 1.
2. Contract Laboratory Program Routine Analytical Services (CLP RAS) volatile, extractable and pesticide/PCB compounds are listed in Tables 3-1 through 3-3 of the QAPP.
3. Contract Laboratory Program Routine Analytical Services (CLP RAS) inorganic parameters are listed in Table 3-4 of the QAPP.
4. No extra sample volume is required for soil matrix spike/matrix spike duplicate (MS/MSD) samples.

5. Samples collected for MS/MSD analysis will be collected at double the volume.
6. One trip blank will be shipped with each shipment of volatile organics (water samples only).
7. MS/MSDs will be collected at a frequency of one per group of 20 or fewer samples.
8. Field blanks for soil gas consist of rinseate blanks.

2.0 PROJECT DESCRIPTION

The Phase I and II Remedial Investigations, both conducted by Camp Dresser & McKee Inc. (CDM) under the direction of the Illinois Environmental Protection Agency (IEPA), have identified several source areas of volatile organic compound (VOC) contamination in southeast Rockford, Illinois. The source areas of interest are Areas 4, 7, 9/10, and 11. These areas either contain or are likely to contain significant concentrations of VOCs that contribute to groundwater contaminant plumes delineated during the Phase I and II investigations. The primary objective of the Southeast Rockford Source Control Operable Unit (SCOU) is to provide detailed information to support source remediation and establish soil cleanup levels.

The study area description is provided in Section 2 of the Southeast Rockford SCOU Work Plan (August 1995). The study area is shown on Figure 2-1.



LEGEND:

- AREA 4 SOURCE AREAS TO BE STUDIED
- 10— TOTAL HALOGENATED VOC CONTOUR (ug/L),
DASHED WHERE INFERRED

SCALE:
500 0 1000 Feet

SOUTHEAST ROCKFORD
SOURCE CONTROL OPERABLE UNIT
GROUNDWATER CONTAMINATION
STUDY AREA

Figure No. 2-1

3.0 GENERAL SAMPLING INFORMATION

3.1 SAMPLE CONTAINERS AND PRESERVATION

All surface water and soil/sediment **samples will** be collected in laboratory-decontaminated sample bottles and jars provided by the **IEPA Bottle Repository**. At drilling locations (soil borings and geoprobes), and surface water and sediment sampling locations, concentrations of contaminants are anticipated to be **either low or medium concentrations** as designated by the USEPA Contract Laboratory Program. **Sampling, handling and shipping of the samples will be performed in accordance with these anticipated concentrations.** Sample containers and preservation will conform to the **October 27, 1989 USEPA Region V Sample Handling Manual** as found in Appendix A. The **sample containers will meet the requirements given in, *Specifications and Guidance for Contaminant-Free Sample Containers*, EPA 540/R-93/051, December, 1992.**

The sample containers and their preservation will be as follows:

Surface Water Samples

- Four 40-ml glass VOA vials **will be** collected at each surface water sampling location for volatile organics analysis.
- Three one-liter amber glass **bottles** will be used to collect surface water analyzed for base/**neutral/acid extractable** and pesticide/PCB compounds.
- At sample collection points **where** duplicate samples will be collected, double sample volume for volatile organics, extractables, and pesticides will be

supplied to the designated lab for analysis.

- At sample collection points **where** matrix spike/matrix spike duplicates (MS/MSD) samples **will be collected**, double sample volume for semivolatile analysis **will be supplied to the designated laboratory.**
- All water samples **will be cooled at 4°C** in an iced cooler following individual sample collection .

Soil Samples

In the following discussion, low- and **medium-concentration** samples refer to subsurface soil samples collected during drilling, **surface soil** and sediment samples.

- Low- and medium-concentration soil samples collected for metals and cyanide analysis **will be collected in either** one 8-oz. wide mouth glass bottle or two 4-oz. wide-mouth glass bottles.
- Low- and medium-concentration soil samples collected for semivolatiles will also be collected in **either one 8-oz. or two 4-oz. bottles.**
- Low- and medium-concentration soil samples collected for volatiles will be placed in two 120-ml **wide-mouth** glass jars.
- No extra sample volume **will be collected** for MS/MSD analysis.
- Duplicate samples **will be collected** at double volume for all parameters in their respective sample containers.

Measurements made and samples collected **will be** recorded. All entries will be made in ink and no erasures will be made. If an **incorrect entry** is made, the information will be crossed out with a single strike mark. Wherever a **sample** is collected or a measurement is made, a detailed description of the location of **the station**, which may include compass and distance measurements, shall be recorded. The **number of** the photographs taken of the station with a brief description including and the **direction faced** will be noted. All equipment used to make measurements will be identified, **along with** the date of calibration.

The equipment used to collect samples **will be noted**, along with the time of sampling, sample description, depth at which the **sample** was collected, volume and number of containers. Sample location identifiers **will be assigned** prior to sample collection. Duplicates, which will receive a separate U.S. EPA sample number, will be noted under sample description.

3.5.2 SAMPLE IDENTIFICATION SYSTEM

U.S. EPA SAMPLE NUMBER

Each sample being sent to the CLP for **analysis must** have a U.S. EPA sample number, regardless of the laboratory to which it is **going**. This number will be recorded on the chain-of-custody form and the sample **field book**. The sample number will consist of nine alpha-numeric characters, as follows:

96RS01xyy

The first six characters (96RS01) will **generally** remain constant for RI sampling, and signify the following:

96	Fiscal year 1996
R	Indicates samples sent by CDM
S	Designates project manager
01	Designates survey number

The last three characters will vary during the sampling survey. The character "x" is a single digit alpha code designating the type of **sample**:

S	Sample
D	Duplicate sample
R	Blank sample

The character "yy" is a 2-digit (01 through 99) number designating the sample number. After 99 samples have been collected for the **survey**, the survey number will be changed (characters 5 and 6). For S-type samples, "yy" is used to consecutively number samples taken during this survey. For duplicate (D-type) samples, "yy" is the same as the sample number of which it is a duplicate. For blank (R-type) samples, "yy" is the consecutive number of blank samples taken during this survey.

EXAMPLE U.S. EPA SAMPLE NUMBERS

- 96RS01S01, 96RS01S02, 96RS01S03
Samples No. 01, 02, and 03 of Dewar's Survey No. 1.

- 96RS01D02
Duplicate sample of Sample No. S02.
- 96RS01R01, 96RS01R02
Blank samples No. 01 and 02.

The U.S. EPA sample number(s) will be **recorded** in the field log book and on all other paperwork and labels and will be **cross-referenced** to chain-of-custody and shipping documents. A description of the **sample location** will be entered into the field log book, including compass directions and **distances from** reference points, if applicable.

SAMPLE LOCATION IDENTIFICATION

Each soil, sediment, soil gas and surface **water** sample will also be assigned a sample location ID in addition to the U.S. EPA number. **The first** two letters of the sample location ID denotes the sample matrix. The **number portion** of the location ID will correspond to the sampling location designations. Sample **matrices** will be recorded using the following code:

<u>SAMPLE MATRIX</u>	<u>CODE</u>
Surface Water	SW
Sediment	SD
Soil (borehole)	SB
Soil Gas	SG
Soil (Geoprobe)	GP
Soil (Surface)	SS

Subsurface soil samples collected **during the SCOU** will have up to seven alphanumeric characters. The first two letters will be **the sample** code. The next one to two numbers will be the source area identifier. The next **one to three** numbers will correspond to the soil boring or geoprobe location within the **source area**. Soil borings or geoprobes will have a

one or two-digit designation. The letter suffix will document what depth the sample was collected from, with the letter "A" will representing a surface or near-surface sample, "B" a sample from the second depth interval, "C" the third sample, etc.

An example of a soil sample collected from a soil boring where no well is to be installed is as follows:

SB-4-16D

This identifier denotes a soil sample that would have been collected in Area 4 from soil boring SB16 at the fourth sampling interval (for most soil borings, the 7.5 to 10-foot sample). In general, subsurface soil samples will be collected at depth intervals of 2.5 feet for deep soil borings.

Sediment and surface water samples will be numbered sequentially beginning with SD01 and SW01, respectively. For all sample matrices a final one-letter suffix in parentheses will be added for duplicate or field blank samples. For instance, SG6-01B(D) would represent a duplicate collected for soil gas sample SG6-01B; the suffix "(R)" would represent a field blank for a soil gas or groundwater sample.

Sample designations will be recorded in the sample field book, on the chain-of-custody forms, the traffic reports, the sample identification record form, and on the sample tags affixed to the sample jars.

3.6 SAMPLE DOCUMENTATION FORMS

Sample documentation forms required by the U.S. EPA are numbered and will be accounted for. In the event that a document is voided, it will not be destroyed; instead, voided sample documents will be saved and returned to the Sample Coordinator. Copies of the multiple-copy forms will accompany samples to the laboratory. The other copies will be sent to the Sampling Coordinator immediately following sampling shipment.

A) Chain-of-Custody Form

- 1) One form per shipping container (cooler) will be used.
- 2) Carrier service will not need to sign form if custody seals remain intact.
- 3) Will be used for all samples.

B) Chain-of-Custody Seals

- 1) Two seals per shipping container will be used to secure the lid and provide evidence that samples have not been tampered with.
- 2) Seals will be covered with clear tape.
- 3) Seal numbers will be recorded on Chain-of-Custody Form.
- 4) Seals will be used for all sample shipping containers.

C) Sample Tags

- 1) Each sample container will have a **Sample Tag** affixed to it with string or wire.
- 2) Traffic Report number and **Case Number** will be recorded in "Remarks" section of tag.
- 3) Sample Tag Numbers will be **recorded on** Chain-of-Custody Forms.

D) CRL Sample Data Report

- 1) Will be completed for all **CLP samples**.
- 2) For samples sent to CLP Laboratories, **these** forms will be sent to the Sampling Coordinator to be forwarded to the **RSCC**.
- 3) The forms will be necessary for the **U.S. EPA** to track the samples and ensure data validation.

E) Sample Identification Record Form

- 1) Will provide a means of recording **crucial** sample shipping and tracking information.
- 2) This form will be **maintained for each sample** shipment and forwarded to Sampling Coordinator upon sample shipment.

All paperwork accompanying the **samples being** shipped to the CLP laboratories will be sealed in a plastic bag that is taped to **the inside** of the cooler lid. Copies of the chain-of-custody forms, and other **paperwork (if possible)** will be retained for the field files.

The sample handling technician will **maintain lists** cross-referencing site sample numbers, custody tag number, analyses to be **performed**, custody seal number, shippers' airbill numbers, and consigned laboratories in a **bound** log book using black ink and on the Sample Identification Record Forms. For more **details** on sampling paperwork, refer to Appendix A.

4.0 SAMPLING LOCATIONS AND RATIONALE

4.1 SOURCE AREA INVESTIGATION

An investigation of Source Areas 4, 7, 9/10, and 11 (see Figure 4-1) will be conducted during the SCOU to further define the extent of **contamination** in the vadose zone and to evaluate whether dense non-aqueous phase liquid (DNAPL) is present. The field investigation activities to be performed are described in the following subsections. Additional data may be needed to develop site specific PRGs. **These data** may include parameters such as hydraulic gradient, hydraulic conductivity, **estimate of infiltration**, contaminant source length, and mixing zone depth.

4.1.1 SOIL GAS SURVEY

A soil gas survey of VOCs will be conducted in Areas 4, 7, 9/10, and 11 prior to soil sampling and the treatability study. **These areas** were identified from Phase I and II data, aerial photographs, site visits, and **information regarding** industrial activities. The rationale for each SCOU soil gas survey area is **given in** Table 4-1 and the locations of the soil gas areas are shown in Figure 4-1.

The proposed soil gas sample locations are **shown** in Figures 4-2 through 4-5. It is estimated that a total of 298 soil gas locations (**including** contingency points) will be sampled. Analyses of interest in each area include:

1,1,1-TCA	PCE
1,1-DCA	TCE
	1,2-DCE
	Vinyl Chloride

TABLE 4-1
RATIONALE FOR SOIL GAS AND
SOIL BORING WORK FOR SOURCE CONTROL OPERABLE UNIT
SOUTHEAST ROCKFORD

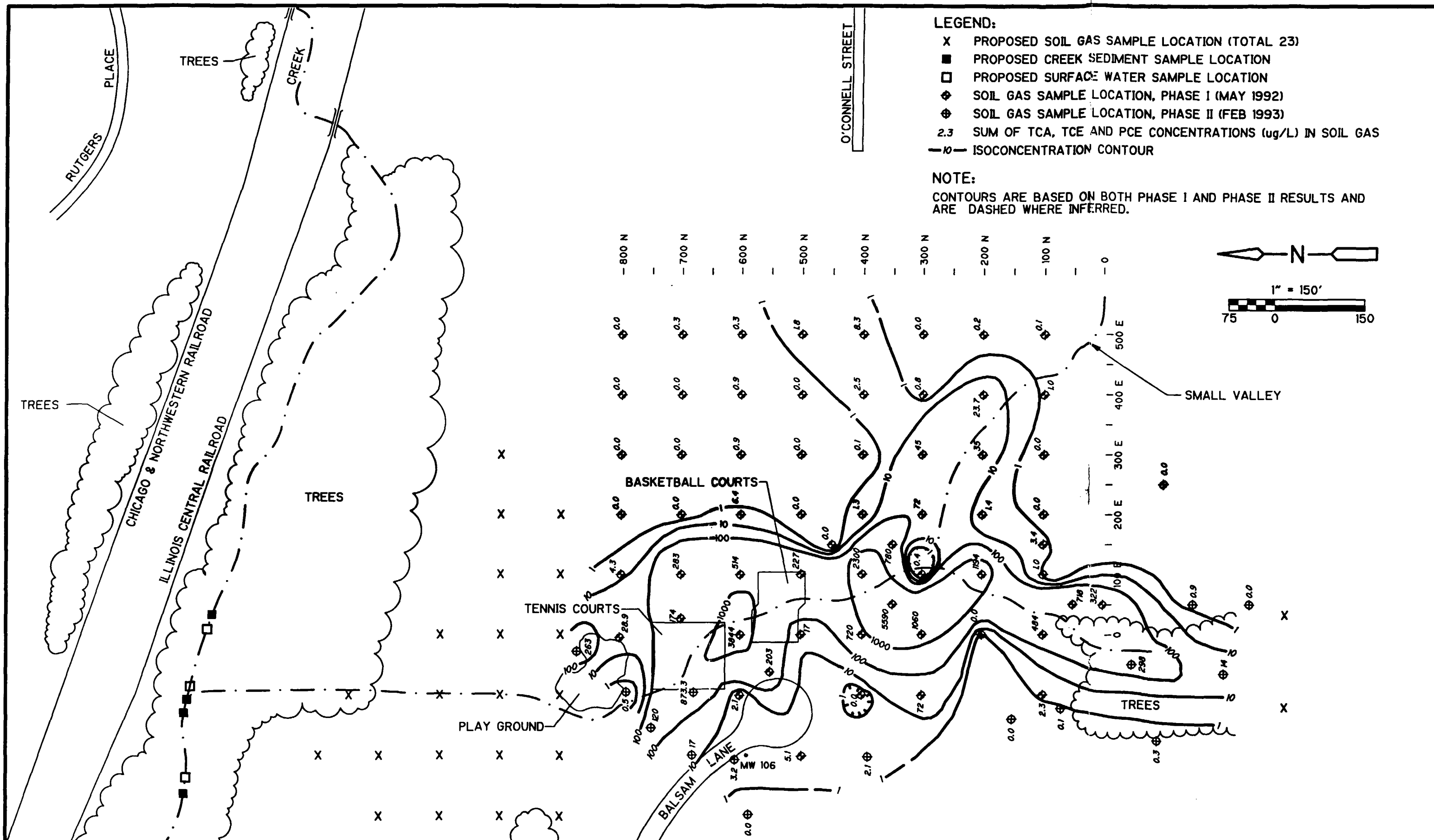
Location	Soil Gas Survey Area	Proposed Soil Gas Survey Points	Proposed Soil Borings (Approximate)	Rationale
Adjacent to Marshall Street and Alton Avenue	4	38 ¹	2	Close off the northeast, east, and south portions of the area.
East end of Balsam Lane	7	27 ²	2	Close off the northern boundary and southwest corner of the area.
Adjacent to 9th Street between Twenty-third and Harrison Avenues	9/10	176 ³	6	Augment existing soil gas data.
Northeast of 11th Street and Harrison Avenue	11	57 ⁴	3	Augment existing soil gas data.

- ¹ Includes 6 contingency points
- ² Includes 4 contingency points
- ³ Includes 30 contingency points
- ⁴ Includes 10 contingency points



CDM
environmental engineers, scientists,
planners, & management consultants

Figure No. 4-2



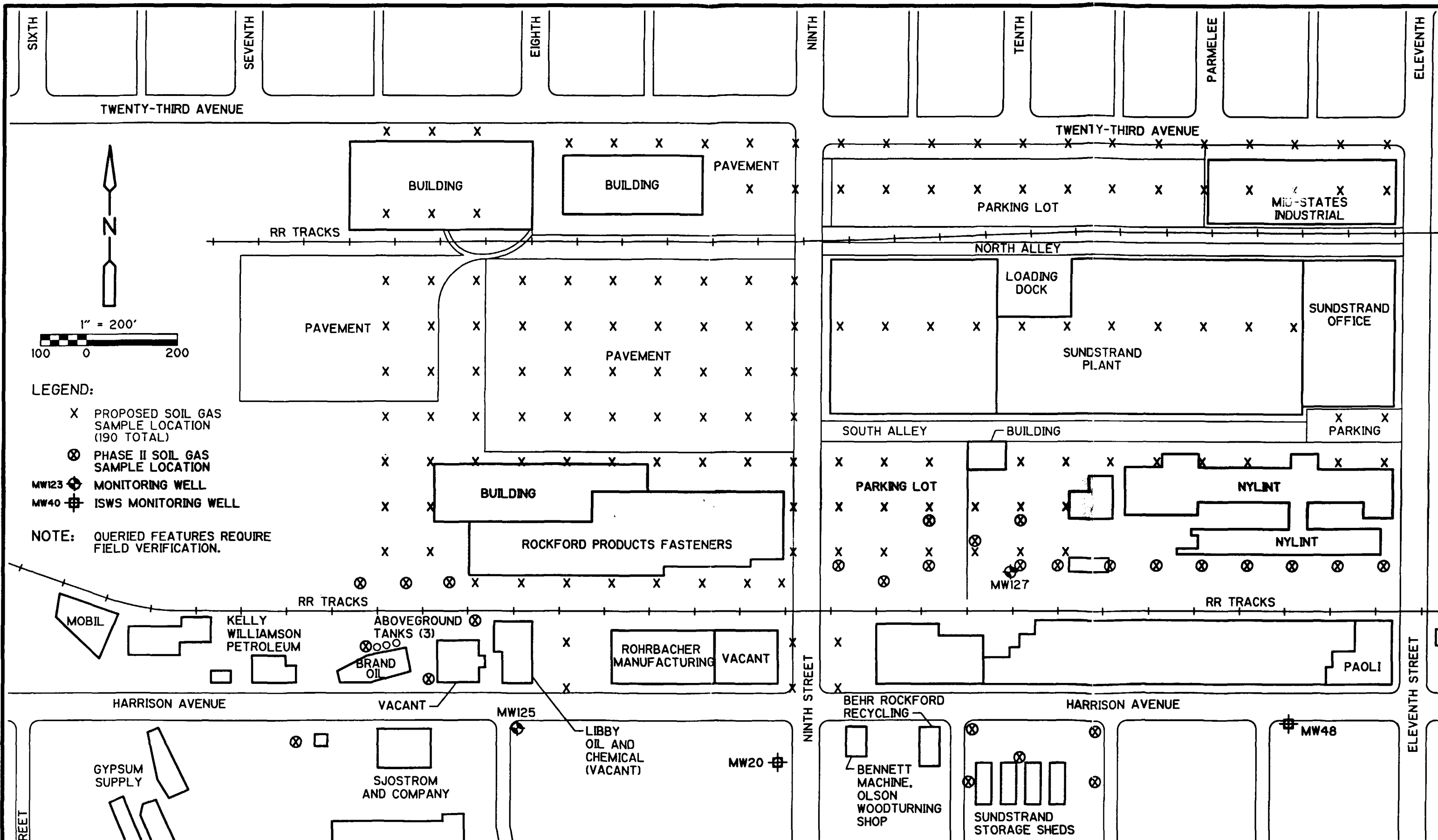
M. KUZEL, NMW-CHI

5.33.08

12/14/95 10:40:52

FIG3-4

K:\168\14\SOURCE\



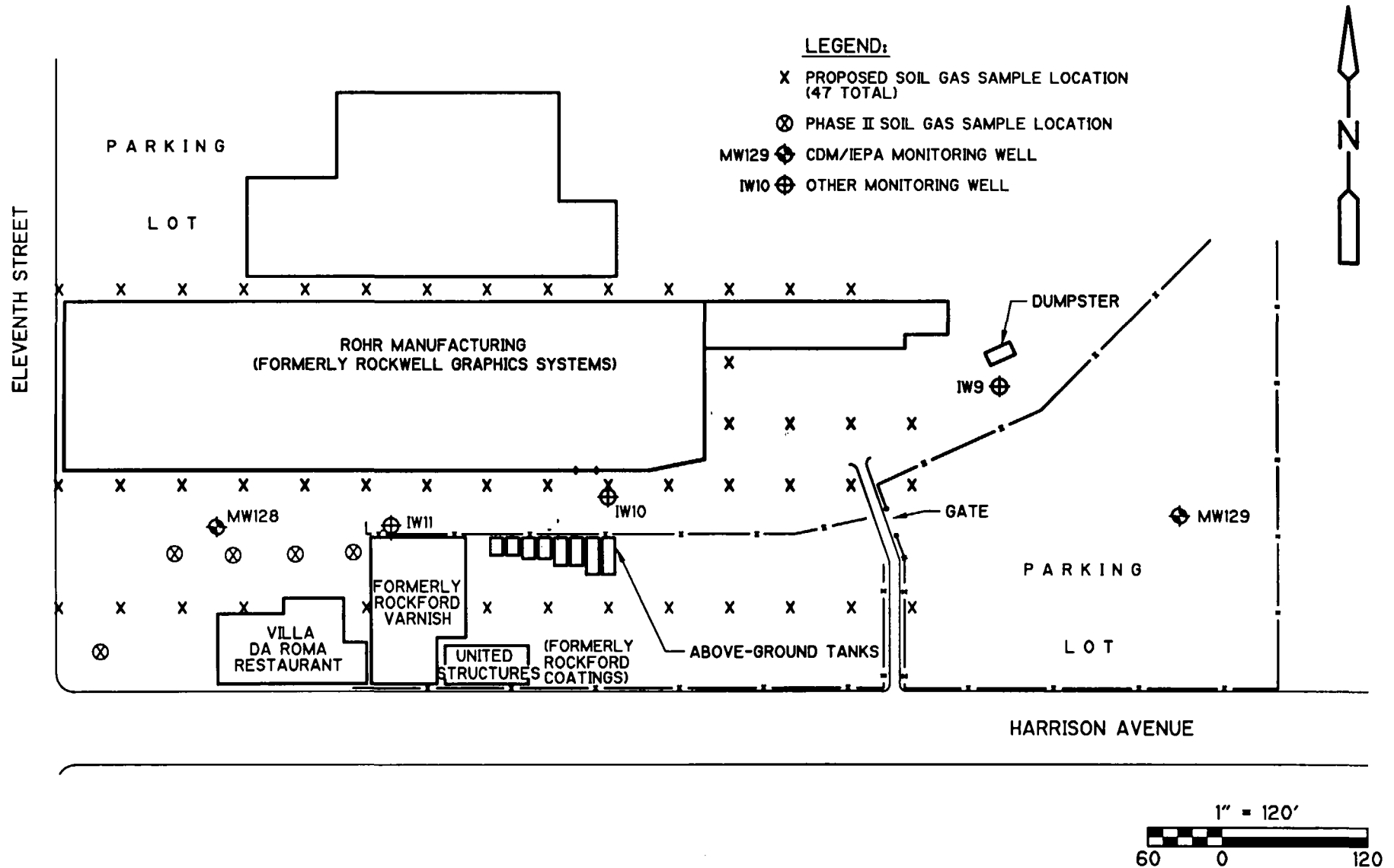
CDM
environmental engineers, scientists,
planners, & management consultants

SOUTHEAST ROCKFORD SOURCE CONTROL
OPERABLE UNIT

**AREA 9/10 SOIL GAS
SAMPLE LOCATIONS**

Figure No. 4-4

US 00968



SOUTHEAST ROCKFORD SOURCE CONTROL OPERABLE UNIT

AREA 11 SOIL GAS SAMPLE LOCATIONS

Figure No. 4-5

In addition, in Areas 9/10 and 11 the following compounds will be quantified:

Benzene
Ethylbenzene
Toluene
Xylenes

Soil gas concentrations will be used to **define** contaminated areas in or near the sources. Soil gas points will be spaced 50 to 100 feet apart in a rectilinear grid pattern. Deviations from this pattern may be necessary to avoid **underground** utilities or above ground obstacles. A Geoprobe unit will be used to collect **soil gas samples**. The depth of sample collection will vary with the depth to groundwater. **It is anticipated** that soil gas samples will be collected at depths between 5 and 30 feet. Soil gas samples will be analyzed shortly after collection using a gas chromatograph located at the site. Results of the soil gas survey will be used to locate Geoprobe soil samples and soil borings.

4.1.2 GEOPROBE SOIL SAMPLES

Soil samples will be collected with a Geoprobe unit from 25 percent of the soil gas sampling locations to confirm the soil gas results and to help delineate the extent of soil contamination. These locations will be selected both to **confirm** hot spots and to better define areas where soil gas concentrations begin to decrease or are non-detect. The likely distribution will be 50 percent soil gas hot spots and 50 percent low-level and/or non-detect soil gas points. Two soil samples from the vadose zone will be collected at each location and sent to an analytical laboratory for Target Compound List (TCL) **volatile** organics analysis. An estimated 88 samples will also be analyzed for B/N/A **extractables** and pesticides/PCBs. These samples will be collected from Area 9/10 where **no subsurface** analytical data was collected during previous investigations. The first soil sample will be taken from the interval exhibiting large

soil gas concentration, and the second **sample** will be collected at greater depth than the first where field headspace screening indicates **little or no** organic vapors. A PID or FID will be used for field screening measurements and the results will be used to locate the positions of the deep soil borings described below.

4.1.3 SOIL BORINGS

Soil borings will be drilled in Areas 4, 7, 9/10, and 11 in areas where soil gas and field headspace measurements indicate **high VOC concentrations**. The primary objectives of the deep soil borings is to determine whether DNAPL is present near the zones of highest contamination, and to provide detailed information about the stratigraphy for proper placement of the soil vapor extraction wells that will be installed during the treatability study. The borings will be sampled continuously with a split-barrel sampler and advanced until either a contaminated clay unit or **bedrock** is encountered. In Area 7, bedrock is expected to be approximately 80 feet below grade; bedrock is expected to be more than 100 feet deep in Areas 4, 9/10, and 11. Two borings will be drilled in Areas 4 and 7, three borings in Area 11, and six borings in Area 9/10 because relatively little is known about the subsurface conditions in this area. Boring depth will be 80 feet in each area except in Area 11, where a 60 foot depth (approximately 30 feet below the water table) is anticipated because of the predominance of compounds that are less dense than water. If field screening indicates contamination at a depth of 60 feet at boring locations in Area 11 or at a depth of 80 feet in Areas 4 and 9/10, the borehole will be advanced to bedrock expected to be at a maximum depth of 120 feet.

Soil samples will be visually examined, screened for organic vapors with a PID or FID, and select samples will be physically tested to detect NAPL. Based on visual characteristics and field screening results, one sample from each boring in Areas 4, 7, and 11, will be analyzed

for TCL volatiles organics. Two soil samples from each of the six borings in Area 9/10 will be analyzed for TCL volatiles, Target Analyte List (TAL) metals and cyanide.

4.1.4 RESIDENTIAL AIR SAMPLING

Residential air sampling will be conducted by the Illinois Department of Public Health (IDPH) in selected homes based on the results of the soil gas sampling. CDM will review the data generated and incorporate the results as appropriate in the Technical Memorandum.

4.2 AREA 7 SURFACE WATER AND CREEK SEDIMENT SAMPLING

Surface water and sediment from the creek that runs along the northern boundary of Area 7 will be sampled to characterize this portion of the site. One water sample will be collected at the confluence of the creek and the small valley that runs south to north through Area 7 (Figure 4-3), and one water sample will be taken upstream and one downstream of this point. In addition, two sediment samples will be collected at the confluence point, and one sample each from upstream and downstream of this point. The surface water and sediment samples from the creek will be sent to an analytical laboratory for TCL organics analysis.

IEPA/U.S.EPA will use the surface water and sediment data to evaluate the potential for ecological impacts from Area 7 and need for additional sampling in Area 7.

4.3 SURFACE SOIL SAMPLING

A maximum of ten surface soil samples will be collected during the SCOU. Locations will be determined in the field based on the results of the soil gas sampling. Residential and park areas will be the primary areas targeted for sampling. It is expected that four samples will be collected in Area 7, north of the playground and south of the creek; four samples will be

collected in Area 9/10 in the residential area north of Twenty-Third Avenue and two samples from Area 4, east of the Swebco facility. No samples are currently proposed for Area 11. Samples will be analyzed for full RAS Target Compound List Organics and RAS Metals and Cyanide.

5.0 SAMPLING EQUIPMENT AND PROCEDURES

5.1 SOIL GAS SURVEY

A soil gas survey of VOCs will be conducted in Areas 4, 7, 9/10, and 11 to define contaminated areas in or near the sources. A total of 323 soil gas sample locations have been identified and are shown on Figures 4-2 through 4-5. Soil gas points will be spaced 50 to 100 feet apart in a rectilinear grid pattern. Deviations from this pattern may be necessary to avoid underground utilities or above ground obstacles.

The soil gas samples will be collected using the Post Run Tubing (PRT) system that utilizes a hollow metal probe driven into the ground with an expendable point using the Geoprobe system. The leading hollow probe rod is fitted with an expendable point holder and an expendable point is then driven to the desired sampling interval. The expendable point holder has a left-hand female threaded opening that accepts an aluminum left-hand threaded tubing adaptor. A required length of 1/4-inch O.D. polyethylene tubing is fitted to the hollow tubing adaptor. The tubing and adaptor are lowered down inside of the probe rods and threaded into the expendable point holder. To assure an air tight seal is maintained, a rubber o-ring is placed between the tubing adaptor and the expendable point holder. As the probe rod string is pulled up a few inches it exposes a cavity of soil from which a representative soil gas sample can be collected. The tubing and cavity are purged of three volumes using a vacuum pump at the surface. A vacuum chamber fitted with a pre-sterilized 0.5 liter Tedlar bag is connected to the sample tubing and evacuated generating negative pressure inside the chamber allowing the bag to fill with soil gas. Soil gas samples should never contact potentially sorbing materials. Soil gas samples will be collected at depths between 5 and 30 feet, depending on the depth to groundwater. The Tedlar bags will

be sub-sampled by a sterilized glass syringe to accommodate analytical volume requirements. The sample will then be injected into the gas chromatograph for analysis. More than two injections may be necessary where there are multiple contaminants that required different sample sizes for chromatograph analysis.

After the soil gas sample has been collected, the expendable point remains in the soil and the probe rods are removed from the ground. The hole will then be sealed with granular bentonite, and an asphalt or concrete patch will be used to restore the area to pre-investigation activities, if necessary. Additional information on sampling equipment and procedures for the soil gas survey is provided in SG-1 contained in Appendix B.

5.2 GEOPROBE SOIL SAMPLES

In order to confirm hot spots and better define areas where soil gas concentrations begin to decrease, approximately 25% of the soil gas sampling locations will have two soil samples collected (75 locations, 150 soil samples) from the vadose zone. The soil samples will be collected from an average depth of 20 feet using the Geoprobe system. The first soil sample will be taken from the interval exhibiting large soil gas concentration, and the second sample will be collected at greater depth than the first where field headspace screening indicates little or no organic vapors. A PID or FID will be used for field screening measurements as described in Section 5.3. Acetate sleeves will be used in the soil collection tool to contain the soil samples. After the soil samples have been collected, the acetate sleeve will be cut and the soil sample will be transferred to an unpreserved, clean, USEPA CLP approved containers for analysis by a CLP laboratory. VOC samples will be grab samples, selected visually or by screening, and placed immediately into 120 ml vials.

After the soil samples have been collected and the probe removed from the ground, the

remaining hole will be backfilled with **granular bentonite** to six inches below grade, and an asphalt or concrete patch will be used to **restore** the area to pre-investigation conditions, if necessary. Additional information on **sampling equipment** and procedures for geoprobe soil sampling is provided in SS-1 contained in **Appendix B**.

5.3 SOIL BORING SAMPLES

A total of 13 soil borings will be drilled in **Areas 4, 7, 9/10, and 11** in areas where soil gas and field headspace measurements indicate **high VOC concentrations** in order to determine whether DNAPL is present near the **zones of highest contamination** and to provide detailed information about the stratigraphy for **proper placement** of the soil vapor extraction wells during the treatability study. The borings **will be** advanced by means of hollow stem augers, which will serve as a temporary casing for the borehole. The borings will be sampled continuously with a split-barrel sampler and advanced until either a contaminated clay unit or bedrock is encountered. Upon boring **termination**, the borehole will be incrementally grouted from the bottom to the surface as the augers are withdrawn. The grout will consist of a high solid bentonite clay that is **nontoxic and nonorganic**.

Subsurface soil sample from the deep boring will be collected in accordance with ASTM standards for analytical and lithologic **purposes**. These samples will be visually examined and screened in the field for VOCs with a **PID or FID**. Field screening will consist of placing a small amount (6-7 grams) of a **representative subsurface soil sample** into a 4 oz. laboratory jar or a plastic bag. The jar mouth **will then be** covered with aluminum foil (or the bag closed) and allowed to sit for approximately **one-half hour** at a temperature 60 degrees F or greater. The organic vapor content **inside the sample jar** will then be determined by piercing the aluminum foil with instrument probe and **noting** the organic vapor level. Levels will be recorded in the sample field book. **Procedures** for the field organic vapor detection

instrument are provided in Appendix C. **The subsurface sample in each deep soil boring with the highest screening concentration of VOCs will be submitted for TCL volatile organics analysis. If elevated VOCs are not detected in a particular boring the sample nearest the water table will be submitted for laboratory analysis.** In addition, two subsurface soil samples from each of the four borings in Area 9/10 will be submitted for TAL inorganics analysis.

All subsurface analytical soil samples **will be collected** from decontaminated split-spoon samplers provided by the subcontracted **drilling** firm during drilling activities. General soil sampling procedures are discussed in Appendix D. Sample collection procedures are summarized as follows:

- The split-spoon sampler **will be placed** on a decontaminated stainless steel tray and opened following **recovery of the sampler** from the borehole;
- Soil samples will be **transferred from** the split-spoon sampler into laboratory-sterilized sample jars by **CDM field samplers** wearing surgical gloves using decontaminated stainless steel **spatulas** or stainless steel scoops (sample containers are listed in Table 3-1;
- VOC samples will be **grab samples**, selected visually or by screening, and placed immediately into 120 ml vials;
- The sample bottle lids **will be securely tightened** to the sample jars;
- The exterior of the filled **sample jars** will be decontaminated as described in Section 6;

- Samples collected for field **organic** vapor monitoring will be screened and values will be recorded in the **sample** field book.
- The lithologic, visual and **olfactory** characteristics, organic vapor readings as well as the sample depth and **identification** designation (as described in subsection 3.5.2) will be **recorded** in the field book; and
- The sample jars will be **sealed** in a zip-lock bag and immediately placed in an iced cooler

Lithologic samples will be collected for the **purpose** of determining and describing the geologic materials present at depth. The **lithologic** samples will be visually inspected and classified by CDM's onsite geologist. **In practice**, all subsurface soil samples from the borings will be used for lithologic purposes. **As previously mentioned**, subsurface soil samples will be collected continuously in the deep borings. The lithologic samples will be used to gain a clear understanding of the nature of the **materials** present at depth, to aid description of geologic materials penetrated by the **boreholes**, to assist in stratigraphic correlation of clay deposits, and to define preferential pathways of groundwater (and contaminant) migration.

Selected subsurface soil samples, based on **visual** characteristics and field screening results, will undergo physical testing to detect **non-aqueous** phase liquid (NAPL) using the hydrophobic soil-water shake test¹. The **procedure** for the visual detection of NAPL in soil using the hydrophobic soil-water shake test is as follow:

1. A soil sample is collected and **put into** a Ziploc polyethylene bag for storage.

¹DNAPL Site Evaluation, EPA/600/R-93/022, February, 1993 (USEPA, 1993)

2. Three minutes after the sample is containerized in the bag, the probe tip of a Photo-Ionization Detector is inserted into the bag to determine if volatile organics are present in the headspace of the sample.
3. After the headspace reading has been collected, a visual examination of the sample is made to determine if free form NAPL is present in the sample.
4. Upon completion of the visual examination, 20 cubic centimeters of sample is transferred from the polyethylene bag to a 50 milliliter polyethylene test tube using a stainless steel spoon. Twenty milliliters of distilled water is then added to the soil in the test tube and shaken by hand for approximately 10 seconds to create a soil-water suspension.
5. After the soil-water suspension has been created, another visual check for NAPL presence is made by looking through the test tube walls and at the fluid surface.
6. Upon completion of the visual test, approximately two milligrams (an amount that would rest on the edge of a toothpick) of Sudan IV, a nonvolatile hydrophobic dye, is placed into the test tube with the soil-water suspension. It is important during this step to be cautious when using the Sudan IV dye, as it is an irritant, and possible mutagen which should not come in contact with skin or eyes.
7. After the dye has been added to the test tube containing the soil-water suspension, the tube is manually shaken for 10 to 30 seconds. When the shaking time has elapsed, a visual inspection of the test tube is made to determine if NAPL is present in the sample. Again it is important to be cautious when shaking the soil-water suspension after the dye has been added.

5.4 SURFACE WATER SAMPLES

Three surface water samples will be collected from the creek that runs along the northern boundary of Area 7 to characterize this portion of the site. One water sample will be collected at the confluence of the creek and the small valley that runs south to north through Area 7 (Figure 4-3), and one water sample will be taken upstream and one downstream of this point. The techniques for sampling are described in SIPM method #562001 contained in Appendix D. Field measurements of pH, conductivity and temperature will be collected. The surface water samples will be laboratory-analyzed for TCL organics.

5.5 SEDIMENT SAMPLES

Four sediment samples will be collected. The sediment sampling locations will correspond to the surface water sampling locations, except that two sediment samples instead of one sample will be collected at the confluence point. The samples will be collected using a sediment core sampler and will consist of the top 10 inches of material at the sampling location. Three samples will be selected for a composite sample at each location. The sample core will be emptied, mixed in a stainless steel tray and transferred into the appropriate sample containers using stainless steel spatulas. Decontamination of sampling equipment will proceed according to the standard decontamination protocol presented in Table 6-1, Section 6.2.

The sediment samples will be shipped to the laboratory for TCL organic analysis. Sediment sampling procedures are described in the SIPM method 5614005 contained in Appendix D.

5.6 SURFACE SOIL SAMPLES

A maximum of ten surface soil samples will be collected at locations determined in the field based on the results of the soil gas sampling. The samples will be collected using a

decontaminated stainless steel spatula or scoop from 0 to 6 inches. These samples will be visually examined and screened in the field for VOCs with a PID or FID using the procedures described in Section 5.3. Three samples will be selected for a composite sample at each location. The soil samples will be placed in a stainless steel bowl for mixing and transferred into laboratory-sterilized sample jars using stainless steel spatulas. VOC samples will be grab samples, selected visually or by screening, and placed immediately into 120 ml vials. Decontamination of sampling equipment will proceed according to the standard decontamination protocol presented in Table 6-1, Section 6.2

The soil samples will be shipped to the laboratory for TCL organics and TAL inorganics analysis. General soil sampling procedures are discussed in Appendix D.

6.4 STORAGE AND DISPOSAL OF SCOU-GENERATED WASTES

The sampling and drilling activities are **expected** to generate solid and liquid "waste." The activities, the anticipated type and the **planned** handling of the wastes are summarized below.

- Soil boring and geoprobe **installation**: SOLID: drilling cuttings and excess soil/cuttings collected and **retained in** drums for future disposal as directed by the IEPA; LIQUIDS: none

All disposable protective clothing, disposable sampling equipment and liquids generated by decontamination procedures will be **contained in** 55-gallon drums and stored in a secure area designated by IEPA. Disposal of these **materials** will be as directed by IEPA.

Solids and liquids will be contained **separately**. Ultimate disposal of SCOU-generated wastes will proceed as directed by IEPA.

7.0 FIELD QUALITY CONTROL PROCEDURES

To ensure the level of data quality required for Superfund Remedial Investigations, the following Quality Control (QC) procedures will be performed. QC sample requirements are summarized in Table 1-1.

7.1 SOIL AND SURFACE WATER QC SAMPLES

Field Duplicates

Aqueous 1,4,10 RDB

One duplicate soil/sediment and ~~surface water~~ sample will be collected for every 20 samples (or portion thereof) collected in the field. Duplicate samples will be collected at the same sample volume and in the same type of container as other samples. Duplicate sample quantities and collection shall apply to both soil and water samples.

Field Blanks

One field blank water sample will be prepared for every ten surface water samples collected. Field blanks will be prepared by filling water sample bottles with reagent-grade distilled water from the sampling device (if possible), at the same volume as the surface water samples. Sample bottles for all parameters will be prepared. These samples will be prepared in close proximity to an actual sample location. This location will be recorded in the sample field log book.

Trip Blanks

A trip blank for volatile organic analysis (VOA) will be included in each sample shipment for volatile organic analysis. The trip blank will consist of four 40-ml VOA vials filled with reagent-grade distilled water. The trip blank will be prepared in the office or laboratory, transported to the field, and shipped with the other samples to the CLP without being opened. The trip blank will be documented on a traffic report form for shipment to the Contract Laboratory Program.

Matrix Spike and Matrix Spike Duplicates

All samples designated as MS/MSD samples will be collected as specified in the USEPA Region V Sample Handling Manual. Matrix spike samples will be denoted by the sample number followed by an -MSD suffix on sample tags, chain-of-custody forms, and other appropriate sample paperwork.

Water samples for semivolatile (extractables and pesticides/PCBs) MS/MSD analysis will be collected at double volume at a frequency of one per twenty samples.

7.2 SOIL GAS QC SAMPLES

Field Blanks

Field blanks for soil gas samples will include system blanks and rinseate blanks. One system blank will be run each day prior to sampling to check the sampling apparatus for contamination. Rinseate blanks will be collected from the soil sampling equipment after every five samples and at the beginning of each day, if necessary. Further details on system

and rinseate blanks are provided in Section 6.0 SOP FOR SOIL GAS SAMPLE COLLECTION AND ANALYSIS in Appendix A of the QAPP.